Idaho National Engineering & Environmental Laboratory
Bechtel BWXT Idaho LLC.

DIRECT PUSH WASTE ZONE TENSIOMETERS

Summary:
Tensiometers have been installed directly into the Subsurface Disposal Area transuranic waste zone as part of the Type B integrated probing project to measure waste zone water tension in situ at three distinct depths in a probe bundle. Three tensiometers comprise a probe bundle but each tensiometer measures only one depth. This measurement configuration allows for derivation of the waste zone moisture gradient and using data from the Type B soil moisture probes, will allow calculation of moisture flux through the waste zone. Since moisture flux controls the rate that contaminants are released from the waste and transported to the subsurface vadose zone, a better understanding of moisture flux will be vital in understanding the nature and extent and contaminant fate and transport. The data will ultimately be used by decision-makers in selecting remedial options.

Prior to deployment of the Type B probes the data collection method of choice was to be coring into the waste zone. Five different Type B probes were installed as part of the Type B integrated probing project to collect the same information that would have been obtained from coring. Much more data can be derived from the probes. About 300 probes are planned to be installed in lieu of approximately 20 cores, and therefore much better coverage of the waste zone is achieved. The probes will provide data that will be used to determine what the prudent remedial alternative should be for the SDA.

Cost estimates for the sampling of the waste using the coring option were approximately 18 million dollars, based on obtaining 20 cores from Pits 4, 5, 10 and two of the Soil Vault Rows. The approximate cost to deploy the probes was $9.4M in FY '00 and FY '01. Using the full suite of Type B Waste Zone Probes can save the project approximately $8.5M. If this cost avoidance is divided by the five probes then the savings per probe is approximately $1,708,000.

This deployment helps to satisfy STCG needs 6.1.01 (In-Situ Debris Characterization for Partial Retrieval), 6.1.02 (Real Time Field Instrumentation for Characterization and Monitoring Soils and Groundwater) and 6.1.27 (Integrated Suite of In Situ Instruments to Determine Flux in the Vadose Zone).

Qualitative Benefit Analysis		
Programmatic Risk	●	The OU 7-13/14 RI/FS noted a lack of matric potential data that is necessary to determine whether waste is migrating from the SDA. Tensiometers would provide these data. Without these data the project may be required to implement the most conservative remedy without justification.

Technical Adequacy	◒	The Tensiometers were custom-made for the SDA probing project.
Safety	●	The safety aspect of the integrated probing project is vastly improved over the baseline drilling and coring effort. Avoided are the risks associated with drilling rig activities, and the risks of handling and sampling cored waste zone materials. There is also a reduction in exposure to contaminants as all waste is left in place. An Engineering Design File was completed for the Tensiometers and was reviewed and approved by the project safety engineer.
Schedule Impact	◒	All Type B probes will be installed by year-end FY01. This is approximately 18 months ahead of the date when coring could have been completed assuming no setbacks.

●	◒	○	◓	◉
Major Improvement	Some Improvement	No Change	Somewhat Worse	Major Decline

Quantitative Benefit Analysis	
Cost Impact Analysis	Cost estimates for the sampling of the waste using the coring option were approximately 18 million dollars, based on obtaining 20 cores from Pits 4, 5, 10 and two of the Soil Vault Rows. The approximate cost to deploy the probes was $9.4M in FY '00 and FY '01. Using the full suite of Type B Waste Zone Probes can save the project approximately $8.5M. If this cost avoidance is divided by the five probes then the savings per probe is approximately $1,708,000. Annual Savings for total project — $8.54 M Life Cycle Cost Savings per probe — $1.708 M Return-On-Investment (ROI) — 91 %

SCIENCE AND TECHNOLOGY BENEFIT ANALYSIS DEPLOYMENT APPROVALS

Technology Deployed: DIRECT PUSH WASTE ZONE TENSIOMETERS

Date Deployed: **Estimated** 09/15/01

EM Program(s) Impacted: Environmental Restoration Program

Approval Signatures

Lee Smith 8/23/01

Contractor Program Manager Date

Contractor Program Manager Date

Kathleen E Hain 8/23/01

DOE-ID Program Manager Date

DOE-ID Program Manager Date

Worksheet 1: Operating & Maintenance Annual Recurring Costs

Expense Cost Items *	Before (B) Annual Costs	After (A) Annual Costs
1. Equipment	$ 1,472,534.00	
2. Purchased Raw Materials and Supplies	$ -	$ -
3. Process Operation Costs:	$15,730,063.00	
Utility Costs	$ -	$ -
Labor Costs	$ 690,200.00	$ -
Routine Maintenance Costs for Processes	$ -	$ -
Subtotal	$16,420,263.00	$ -
4. PPE and Related Health/Safety/Supply Costs	$ -	$ -
5. Waste Management Costs:		
Waste Container Costs	$ -	$ -
Treatment/Storage/Disposal Costs	$ -	$ -
Inspection/Compliance Costs	$ -	$ -
Subtotal	$ -	$ -
6. Recycling Costs		
Material Collection/Separation/Preparation Costs:		
a) Material and Supply Costs	$ -	$ -
b) Operations and Maintenance Labor Costs	$ -	$ -
Vendor Costs for Recycling	$ -	$ -
Subtotal	$ -	$ -
7. Administrative/other Costs	$ -	$ -
Total Annual Cost:	$17,892,797.00	$ -

* See attached Supporting Data and Calculations.

1 Equipment
The Equipment cost here is taken from a cost estimate completed in March '01 for coring in the SDA. The line item was identified as DSE spare parts & consumables.

3 Process Operation Costs
This large amount was the total of estimated costs for several operations. These were Operational Cold Testing, Coring activities in Pit-9, Subcontractor support, Sampling analysis and characterization. Labor
This amount was identified in the cost estimate as Phase II safety analysis, and Design support.

Worksheet 2: Itemized Project Funding Requirements*
(i.e., One Time Implementation Costs)

Category	Cost $
INITIAL CAPITAL INVESTMENT	
1. Design	$ 1,500,000
2. Purchase	$ 5,300,000
3. Installation	$ 1,500,000
4. Other Capital Investment (explain)	$ -
Subtotal: Capital Investment= (C)	$ 8,300,000
INSTALLATION OPERATING EXPENSES	
1. Planning/Procedure Development	$ 250,000
2. Training	$ 50,000
3. Miscellaneous Supplies	$ 150,000
4. Startup/testing	$ 300,000
5. Readiness Reviews/Management Assessment/Administrative Costs	$ 300,000
6. Other Installation Operating Expenses (explain)	$ -
Subtotal: Installation Operating Expense = (E)	$ 1,050,000
7. All company adders (G & A/PHMC Fee, MPR, GFS, Overhead, taxes, etc.)(if not contained in above items)	$ -
Total Project Funding Requirements=(C + E)	$ 9,350,000
Useful Project Life = (L) 1 Years Time to Implemen 0 Months	
Estimated Project Termination/Disassembly Cost (if applicable) = (D) (Only for Projects where L<5 years; D=0 if L>5 years)	$ -
TOTAL LIFE-CYCLE COST SAVINGS CALCULATION FOR IPABS-IS	
(Before - After) x (Useful Life) - (Total Project Funding Requirements + Termination)	
Total Life Cycle Cost Savings Estimate = (B - A) x L - (C+E+D)	$8,542,797
RETURN ON INVESTMENT CALCULATION	

Return on Investment (ROI) % =

$$\frac{\textit{(Before - After) - [(Total Project Funding Requirements + Termination)/Useful Life]}}{\textit{[Total Project Funding Requirements + Project Termination]}} \times 100$$

$$\text{ROI} = \frac{(B-A)-[(C+E+D)/L]}{(C+E+D)} \times 100 \quad 91 \quad \%$$

O&M Annual Recurring Costs:			Project Funding Requirements:			
Annual Costs, Before=	$17,892,797	(B)	Capital Investment=	$	8,300,000	(C)
Annual Costs, After=	$ -	(A)	Installation Op. Exp=	$	1,050,000	(E)
Net Annual Savings=	$17,892,797	(B-A)	Total Project Funds=	$	9,350,000	(C+E)

Note: Before (B) and After (A) are Operating & Maintenance Annual Recurring Costs from Worksheet 1.